(Miers), for example, shows a similarity in the disposition of the grooves of the carapace, particularly in the marked transverse branchial groove (or posterior branch of the cervical), which suggests that the nearest relatives of *P. niloticum* need not be sought for in distant parts even of the same continent.

If this be so, a similar argument applies with greater force to attempts that have been made to trace a connexion between the African Potamonidæ and those of the New World. Ortmann suggested that the South-American Pseudothelphusinæ were linked to the Old-World river-crabs by this same *Acanthothelphusa nilotica*. This conclusion was disproved by Alcock, who showed that the affinities of the Pseudothelphusinæ were with the Gecarcinucinæ, a group which probably does not occur in Africa at all. Bouvier now suggests (C. R. Acad. Sci. clxv. 1917, pp. 617 & 753) that the African *Acanthothelphusa* (with *Erimetopus*) forms a transition to the other American subfamily, the Trichodactylinæ. Here, again, the argument is greatly weakened if it can be shown that the essential characters of *Acanthothelphusa* have been acquired independently in different parts of Africa by various groups of *Potamonautes*; nor am I yet convinced, any more than were Ortmann or Alcock, that the Trichodactylinæ are Potamonidæ at all.

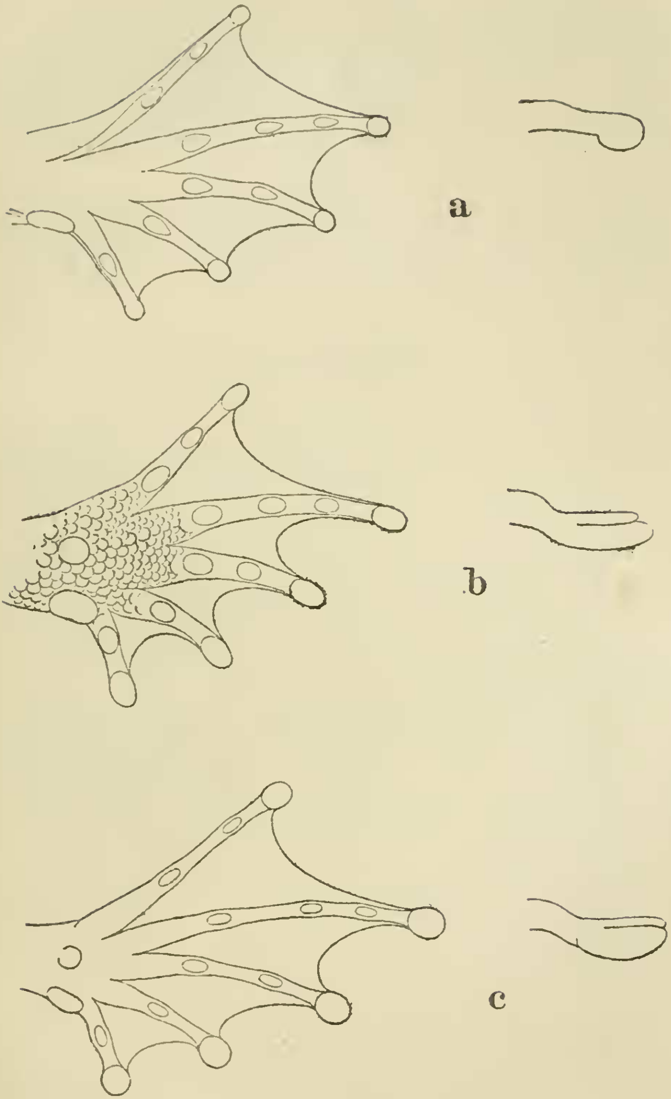
XXVI.—*On the Papuan, Melanesian, and North-Australian Species of the Genus* Rana. By G. A. BOULENGER, F.R.S.

(Published by permission of the Trustees of the British Museum.)

HAVING recently undertaken a much-needed revision of the south-easternmost representatives of the large genus *Rana*, I feel able, thanks to the extensive material accumulated in the British Museum since the publication of the 'Catalogue of Batrachians' in 1882, to offer for consideration new views on the delimitation of the species and on their synonymy, as well as an attempt at a better classification of them.

The species fall under three groups, which may be regarded as natural subgenera :—

1. *Rana*, s. str., represented by one species only, *R. grunniens*, Daud., a close ally of the widely distributed *R. macrodon*, D. & B., from which it differs in the absence of toothlike processes in the lower jaw and in the shorter tibia.



a. *Rana grunniens.*
b. —— *bufoniformis.*
c. —— *papua.*

Lower view of foot and enlarged side view of tip of fourth toe.

2. *Discodeles*, n. n., for three species from the Solomon Islands which differ from the preceding in the presence of a horseshoe-shaped groove on the terminal discs of the toes, or of the fingers also, which are thus divided into an upper and a lower portion, the latter forming a more or less adhesive pad, and in the web between the toes not penetrating far between the outer metatarsals *.

3. *Hylorana*, Tschudi, agreeing with the preceding in the groove on the digital discs, but differing in the outer metatarsals being separated nearly to the base. Five species are referred to this subgenus †.

SYNOPSIS OF THE SPECIES.

I. *Rana*.

Vomerine teeth behind the level of the choanæ, in long and strong oblique series; head a little broader than long; canthus rostralis very obtuse; tympanum $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye; first finger much longer than second; tibio-tarsal articulation reaching the eye; heels meeting when the limbs are folded at right angles to the body; tibia a little over 2 to $2\frac{1}{3}$ times in length from snout to vent; toes with the tips dilated into small discs, webbed to the discs; no glandular dorso-lateral fold; nasal bones large and in contact with each other and with the frontoparietals; omosternum forked at the base; male without secondary sexual characters. 1. *R. grunniens*, Daud.

II. *Discodeles*.

Vomerine teeth behind the level of the choanæ, in short and strong series; tongue with an obtuse papilla in the middle; head broader than long; canthus rostralis obtuse; tympanum $\frac{1}{3}$ to $\frac{1}{2}$ diameter of eye; toes with the tips dilated into small discs; glandular dorso-lateral fold, if present, not confluent with the temporal; nasal bones large and in contact with each other and with the frontoparietals; omosternum forked at the base.

Vomerine teeth not extending outwards beyond the vertical of the inner edges of the choanæ; fingers without discs, first longer than second; tibio-tarsal articulation reaching the temple; heels meet or fail to meet; tibia $2\frac{1}{3}$ times in length from snout to vent; toes $\frac{2}{3}$ webbed;

---

* Several other species, from India (*R. beddomii*, Blgr., *leithii*, Blgr., *semipalmata*, Blgr.), belong to this subgenus, which leads to *Cornufer*, Tschudi.

† *R. holsti*, Blgr., from the Loo Choo Islands, originally described as allied to *R. temporaria*, L., should be referred to *Hylorana*. On the genus *Babina*, Van Denburgh, which has been proposed for it, *cf.* C. R. Ac. Sci. Paris, clxv. 1917, p. 989.

upper parts very warty; an interrupted dorso-lateral fold; belly granular; male unknown .... 2. *R. bufoniformis*, Blgr.

Vomerine teeth not extending outwards beyond the vertical of the inner edges of the choanæ; fingers without discs, first not or but slightly longer than second; tibio-tarsal articulation reaching the eye; heels meet or fail to meet; tibia $2\frac{1}{6}$ to $2\frac{2}{5}$ times in length from snout to vent; toes $\frac{2}{3}$ to $\frac{3}{4}$ webbed; upper parts smooth or warty; no dorso-lateral fold; belly feebly granular; male with internal vocal sacs .... 3. *R. opisthodon*, Blgr.

Vomerine teeth extending outwards beyond the vertical of the inner edges of the choanæ; fingers with the tips dilated into small discs, first longer than second; tibio-tarsal articulation reaching the eye or the tip of the snout; heels meet or feebly overlap; tibia $1\frac{4}{5}$ to $2\frac{1}{6}$ times in length from snout to vent; toes $\frac{3}{4}$ to entirely webbed; skin smooth or feebly warty above, smooth beneath; no dorso-lateral fold; male with external vocal sacs.... 4. *R. guppyi*, Blgr.

III. *Hylorana.*

Vomerine teeth between the choanæ or extending beyond the level of their posterior borders, in oblique groups or short series; canthus rostralis strong; tympanum $\frac{2}{5}$ to $\frac{3}{4}$ diameter of eye; tips of fingers and toes dilated into well-developed discs; glandular dorso-lateral fold, if present, confluent with the supratemporal; nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals; omosternum not forked at the base.

A. No dorso-lateral glandular fold; head as long as broad or broader than long; discs of toes not larger than those of the fingers; outer metatarsal tubercle absent or rather indistinct; tibio-tarsal articulation reaching between eye and tip of snout, or slightly beyond; heels feebly overlapping; tibia $1\frac{3}{4}$ to a little over 2 times in length from snout to vent; male with an external vocal sac on each side of the throat and a large oval gland on inner side of arm........ 5. *R. arfaki*, A. B. Mey.

B. A dorso-lateral glandular fold; head as long as broad or longer than broad; discs of toes larger than those of the fingers; outer metatarsal tubercle present, rarely indistinct.

a. Male with a large external vocal sac on each side of throat and a large oval gland on inner side of arm.

Tibio-tarsal articulation reaching beyond tip of snout; heels strongly overlapping; tibia $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent .... 6. *R. grisea*, v. Kamp.

Tibio-tarsal articulation reaching eye or between eye and nostril; heels more or less overlapping; tibia 2 or a little over 2 times in length from snout to vent .. 7. *R. krefftii*, Blgr.

b. Male with vocal sacs internal, exceptionally external but feebly developed; no gland on inner side of arm.

Tibio-tarsal articulation reaching nostril, tip of snout, or beyond; heels strongly overlapping; tibia $1\frac{1}{2}$ to $1\frac{6}{7}$ times in length from snout to vent .... 8. *R. papua*, Less.

Tibio-tarsal articulation reaching eye or between eye and nostril; heels feebly overlapping; tibia 2 to $2\frac{1}{6}$ times in length from snout to vent .... 9. *R. daemeli*, Stdr.

SYNONYMY AND DISTRIBUTION.

1. *Rana grunniens.*

Rana grunniens, Daud. Hist. Rain. Gren. Crap. p. 65, pl. xxi. (1803), and Hist. Rept. viii. p. 127 (1803); Dum. & Bibr. Erp. Gén. viii. p. 380 (1841); Günth. Cat. Batr. Sal. p. 10 (1858): Bouleng. Cat. Batr. Ecaud. p. 23 (1882), and Tr. Zool. Soc. xx. 1914, p. 249.

Rana subsaltans, Gravenh. Delic. Mus. Vratisl., Batr. p. 35, pl. vii. (1829).

Rana hydromedusa (Kuhl), Tschudi, Class. Batr. pp. 40, 80 (1838).

Rana macrodon (non D. & B.), van Kampen, Nova Guinea, ix., Zool. p. 458 (1913).

Hab. Java (?), Amboina (type), and Dutch New Guinea.

2. *Rana bufoniformis.*

Rana bufoniformis, Bouleng. Proc. Zool. Soc. 1884, p. 210, and Tr. Zool. Soc. xii. 1886, p. 47, pl. viii.

Hab. Solomon Islands (Treasury [type] and Faro).

3. *Rana opisthodon.*

Rana opisthodon, Bouleng. Proc. Zool. Soc. 1884, p. 211, and Tr. Zool. Soc. xii. 1886, p. 50, pl. x.

? *Rana ventricosus*, T. Vogt, Sitzb. Ges. Nat. Fr. Berl. 1912, p. 8.

Hab. Solomon Islands (Treasury and Faro).—*R. ventricosa*, which, according to the description, differs only in having the toes entirely webbed, is from Lambassa.

4. *Rana guppyi.*

Rana guppyi, Bouleng. Proc. Zool. Soc. 1884, p. 211, and Tr. Zool. Soc. xii. 1886, p. 48, pl. ix.

Hab. Solomon Islands (Shortland [type], Faro, New Georgia, Guadalcanar, Rubiana, Isabel).

5. *Rana arfaki.*

Rana arfaki, A. B. Meyer, Mon. Berl. Ac. 1874, p. 138; van Kampen, Nova Guinea, v., Zool. p. 165 (1906), and ix., Zool. p. 36 (1909).
Limnodytes arfaki, part., Peters & Doria, Ann. Mus. Genova, xiii. 1878, p. 418.
Rana macroscelis, Bouleng. Ann. & Mag. Nat. Hist. (6) i. 1888, p. 345, and Ann. Mus. Genova, (2) xviii. 1898, p. 706; Roux, Abh. Senck. Ges. xxxiii. 1910, p. 226; Bouleng. Tr. Zool. Soc. xx. 1914, p. 249.
Rana waigiensis, van Kampen, Bijdr. Dierk. xix. 1913, p. 90, and Nova Guinea, ix., Zool. p. 459, pl. xi. fig. 2 (1913).

Hab. New Guinea (type), Waigeou, and Aru Islands.

6. *Rana grisea.*

Rana grisea, van Kampen, Nova Guinea, ix., Zool. p. 460, pl. xi. fig. 3 (1913); Bouleng. Tr. Zool. Soc. xx. 1914, p. 250.
? *Rana novæ-britanniæ*, part., Werner, Verh. zool.-bot. Ges. Wien, li. 1901, p. 614.

Hab. Dutch New Guinea (Went Mts., 4200 feet [type], and Utakwa R., 2500–3000 feet).

7. *Rana krefftii.*

Hylorana erythræa, part., Günth. Cat. Batr. Sal. p. 73 (1858).
Rana krefftii, Bouleng. Cat. Batr. Ecaud. p. 64, pl. iii. fig. 2 (1882), and Tr. Zool. Soc. xii. 1886, p. 52.
? *Rana novæ-britanniæ*, Werner, Zool. Anz. xvii. 1894, p. 155, and Mitth. Zool. Mus. Berl. i. 1900, p. 111, fig.

Hab. Solomon Islands (San Christoval [type], Santa Anna, Guadalcanar, Isabel).

Werner's description of *R. novæ-britanniæ*, from New Britain, applies well to this species, except for the size of the tympanum, stated to be nearly as large as the eye.

8. *Rana papua.*

Rana papua, Lesson, Voy. 'Coquille,' Zool. ii. p. 59, pl. vii. fig. 1 (1830); Boettg. in Semon, Zool. Forsch. p. 111 (1894); Méhely, Term. Füzet. Budapest, xx. 1897, p. 410; van Kampen, Nova Guinea, v., Zool. p. 164 (1906), ix., Zool. p. 37 (1909), and p. 459 (1913); Bouleng. Tr. Zool. Soc. xx. 1914, p. 250.
Limnodytes waigiensis, Dum. & Bibr. Erp. Gén. viii. p. 514 (1841).
Limnodytes papuensis, A. B. Mey. Mon. Berl. Ac. 1874, p. 52; Doria, Ann. Mus. Genova, vi. 1874, p. 356.
Limnodytes papua, Peters & Doria, Ann. Mus. Genova, xiii. 1878, p. 418.
Limnodytes arfaki, part., Peters & Doria, *l. c.* pl. vi. fig. 1.